Analytical Instrument Qualification According to USP <1058>

Scope, Approach, Requirements

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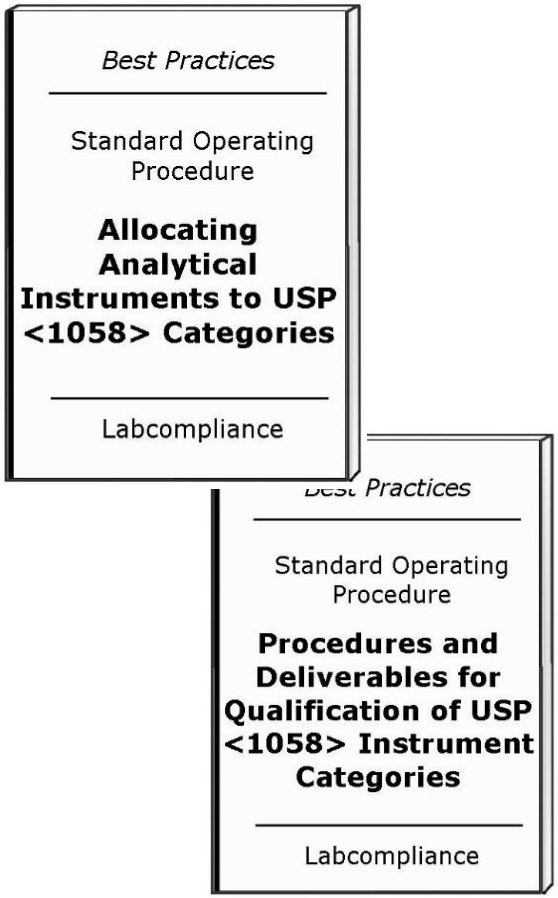
Overview

- FDA and International requirements and enforcement
- The history, objective, scope
- The USP Approach for Instrument Qualification
- Four Phases: DQ, IQ, OQ, PQ
- Instrument categories: Recommended procedures and qualification tasks

DQ: Design Qualification
IQ: Installation Qualification
OQ: Operational Qualification
PQ: Performance Qualification

Reference Material

- SOPs
  - Allocating Analytical Instruments to USP <1058> categories
  - Procedures and deliverables for USP <1058> categories
- FDA Presentation on Equipment Qualification, includes acceptance criteria
- Examples for FDA Warning Letters related to Analytical Instrument Qualification



www.labcompliance.com/misc/conferences/usp-1058.aspx
(available until September 2010)

Regulations and Quality Standards

All GLP, GCP and GMP regulations require analytical equipment to calibrated or qualified

Example: FDA cGMP 21 CFR 211.160 b(4) requires

- The calibration of instruments, apparatus, gauges, and recording devices **at suitable intervals** in accordance with an established **written program** containing specific directions, **schedules, limits for accuracy and precision**,
- Instruments not meeting established specifications **shall not be used.**

GLP: Good Laboratory Practices
GCP: Good Clinical Practices
GMP: Good Manufacturing Practices

FDA Warning Letters

Details of HPLC testing

- Your firm failed to conduct injector and detector performance testing for the HPLC system
- For example, no HPLC injector and detector testing for linearity, accuracy, and precision were conducted, such as
  - various injection volumes and standard concentration testing
  - evaluation of detector for noise/drift;
  - carryover testing to evaluate response at low levels to determine the detection of possible interferences that may affect peaks of interest.

2009

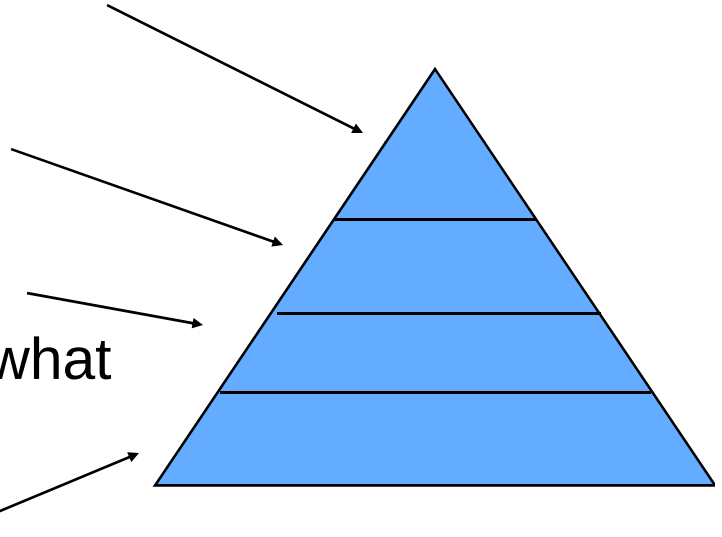
Ref: www.fdawarningletter.com (W-221)

USP General Chapter <1058>: Analytical Instrument

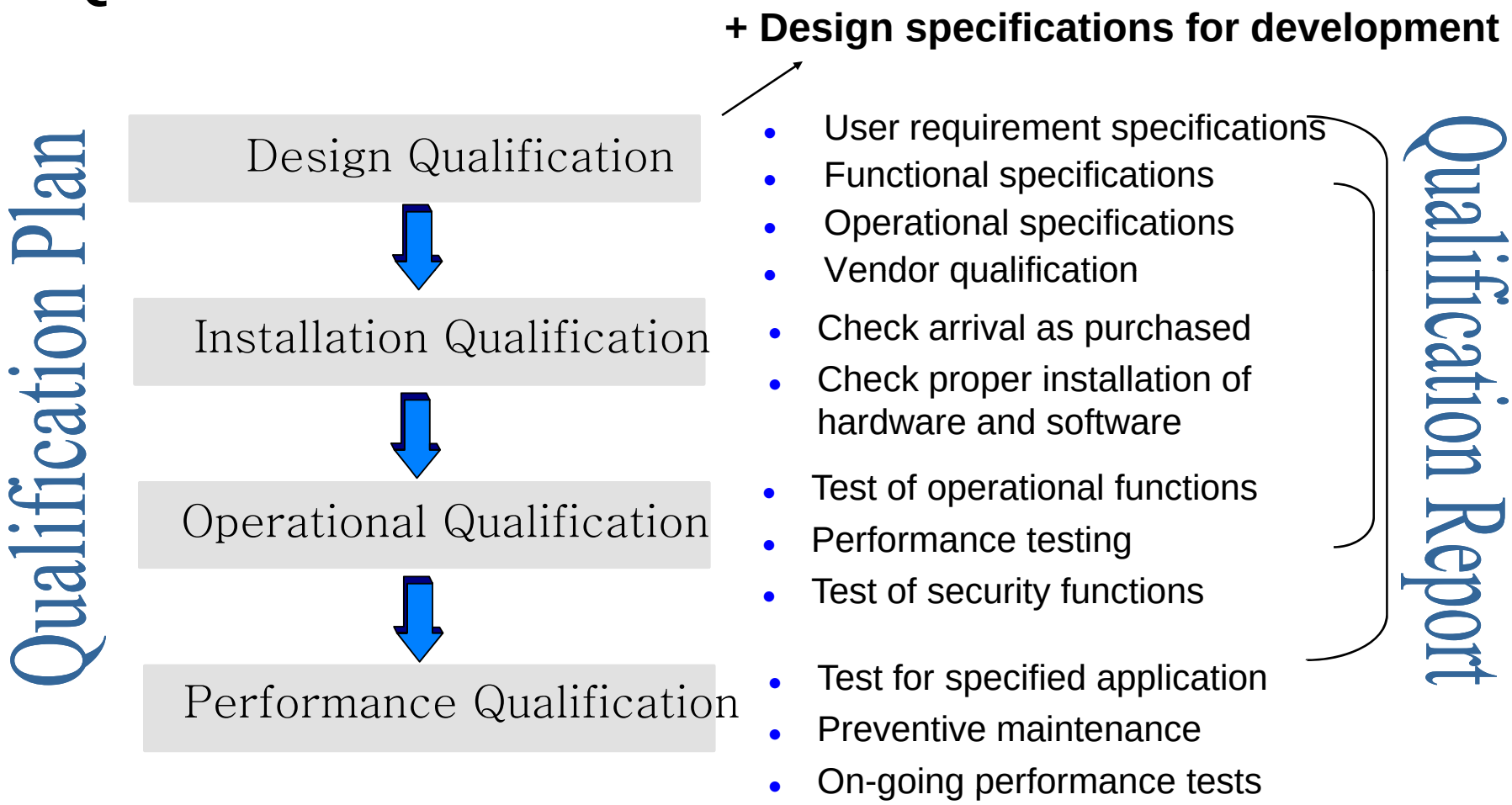
- Developed by an expert team with participation of US FDA, industry and USP
- Released in 2008
- General chapter above 1000 means
  - Other procedures can be used for qualification as long as results are equivalent to USP
  - Mandatory if a USP monograph requires equipment to be qualified or calibrated
- The approach is applicable to all analytical instruments in regulated laboratories
- Approach: 4Q model

AIQ and Other Quality Checks

- Quality control checks
  - Verifies accuracy of sample analysis
- System suitability tests
  - Verifies that the system performs according to analysts expectations
- Analytical methods validation
  - Proof that analytical procedure does what it purports to do
- Analytical instrument qualification
  - Forms the base for generating quality data
  - Proof suitability of the instrument for intended use



Qualification/Validation Phases
4Q Model



Design Qualification (DQ)

- Documented collection of activities that define the functional and operational specifications of the instrument, based on intended purpose
- Shared responsibility between vendor and user

Activities and Documentation

- Vendors
  - Design, develop and manufacture instruments in quality control environment
  - Develop functional and operational product specifications
- Users
  - Develop user requirement specifications
  - Verify that the vendor's instrument meets user's requirements: product specifications, delivery and support
  - Verify that the vendor operates in a quality system environment

Installation Qualification (IQ)

Documented collection of activities to ensure that equipment

- Is delivered as designed and specified
- Is properly installed in the selected environment
- That the environment is suitable for the instrument

Activities and Documentation

- Verify that facilities, utilities, and environment meet vendor requirements
- Assemble and install equipment
- Perform initial diagnostics and testing
- For complex equipment: run reference sample
- Document installation, including drawings

Operational Qualification (OQ)

- Documented collection of activities necessary to demonstrate that an instrument will function according to its operational specifications in the selected environment

Activities and Documentation

- Test functions to verify that the instrument operates in the user's environment as intended by the manufacturer and required by the user.
- Test secure data handling, storage, back-up and archiving
- Tests can be holistic or modular.
- Tests can be done by users or qualified designees.

Performance Qualification (PQ)

- Documented collection of activities necessary to demonstrate that an instrument consistently performs according to specifications as defined by the user, and is appropriate for the intended use.

Activities and Documentation

- Preventive maintenance to ensure trouble free operation for the intended application
- Performance checks, based on the instrument's typical on-site applications
  - Test frequency depends on the ruggedness of the instruments and the criticality of the tests
  - System suitability and QC tests can imply suitable performance

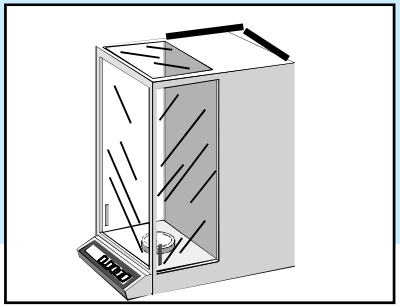
Instrument Categories

- Three instrument categories: A, B, C
- Level of qualification depends of the type of instrument and on application
- User defines category and level of qualification

Magnetic Stirrers
Vortex Mixers

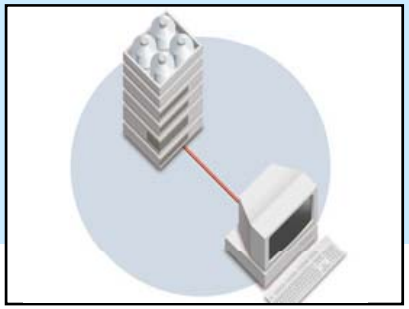
Visual inspection
May not require formal qualification

Balances
pH meters



Verification with specifications

HPLC Systems
Mass spectrometers



Full qualification

Recommended Procedures for Categories (1)

A (2)	B (2)	C (2)
Operation	Operation	Operation
	Qualification	Qualification
	Change Control	Configuration Management
		Back-up, Restore and Archival
		Security
		System Administration
	Preventive maintenance & repair	Preventive maintenance & repair
Problem Reporting	Problem Reporting	Problem Reporting
		Periodic Review
		Retirement

(1): Recommended by Labcompliance
(2): Approaches, activities and procedures should be defined in an equipment qualification master plan

Qualification Deliverables for Categories Recommended by Labcompliance

A (1)	B (2)	C
	Qualification Plan (2)	Qualification Plan
Vendor specifications	User Requirements Specification (2)	User Requirements Specification
		Risk assessment
Vendor's Quality System	Vendor's Quality System	Supplier Assessment
Checklists used during initial inspection	DQ and IQ (2)	DQ and IQ
	OQ and PQ tests	OQ and PQ tests
	Maintenance, repair and change logs	Maintenance, repair and change logs
	Qualification Report	Qualification Report

(1) Category A may not require formal qualification of each individual instrument
(2) Use template format for instrument category B